CANADIAN JOURNAL OF BOTANY

JOURNAL CANADIEN DE BOTANIQUE

Volume 69, 1991

Contents / Sommaire

JANUARY / JANVIER

ARTICLES

Sharon Harney and Paul Widden Physiological properties of the entomopathogenic hyphomycete *Paecilomyces farinosus* in relation to its role in the forest ecosystem 1

Joost A. Stalpers, Keith A. Seifert, and Robert A. Samson A revision of the genera *Antromycopsis*, *Sclerostilbum*, and *Tilachlidiopsis* (Hyphomycetes) 6

M. Serafini, S. Foddai, S. Pieretti, L. Tomassini, and M. Nicoletti Effect of ochratoxin A on aflatoxin production by *Aspergillus parasiticus* 16

Liliane Pellegrini, Marie Epiard-Lahaye et Michel Penot De l'utilisation du lanthane comme traceur de la voie apoplastique chez *Cystoseira nodicaulis* (Fucales, Cystoseiraceae) 18

P. F. Fransz and J. H. N. Schel Cytodifferentiation during the development of friable embryogenic callus of maize (*Zea mays*) 26

M. Pigliucci, M. G. Politi, and D. Bellincampi Implications of phenotypic plasticity for numerical taxonomy of *Ornithogalum montanum* (Liliaceae) 34

A. V. Sturz and C. C. Bernier Fungal communities in winter wheat roots following crop rotations suppressive and nonsuppressive to take-all 39

Christer Magnusson and Wladyslaw Golinowski Ultrastructural relationships of the developing syncytium induced by *Heterodera schachtii* (Nematoda) in root tissues of rape 44

Wladyslaw Golinowski and Christer Magnusson Tissue response induced by *Heterodera schachtii* (Nematoda) in susceptible and resistant white mustard cultivars 53

S. C. Sheppard A field and literature survey, with interpretation, of elemental concentrations in blueberry (*Vaccinium angustifolium*) 63

Barbara J. Cade-Menun, Shannon M. Berch, and A. A. Bomke Seasonal colonization of winter wheat in South Coastal British Columbia by vesicular–arbuscular mycorrhizal fungi 78

Ben A. Faber, Robert J. Zasoski, Donald N. Munns, and Kenneth Shackel A method for measuring hyphal nutrient and water uptake in mycorrhizal plants 87

P. Halama et L. Lacoste Déterminisme de la reproduction sexuée de *Phaeosphaeria* (*Leptosphaeria*) *nodorum*, agent de la septoriose du blé. I. Hétérothallisme et rôle des microspores 95

Ernest Small and Brenda Brookes A clarification of *Medicago sinskiae* 100

I. Garuccio, S. Onofri, A. Evidente, and O. Arrigoni Biotransformation of lycorine by *Cryptococcus terreus* to a stimulant of budding in *Cryptococcus dimennae* 107

B. A. D. Hetrick, G. W. T. Wilson, and J. F. Leslie Root architecture of warm- and cool-season grasses: relationship to mycorrhizal dependence 112

Peter David Premdas and Bryce Kendrick The effect of some commercial pesticide carrier formulations on the germination of *Pseudoaegerita matsushimae* propagules 119

Bai-Ling Lin and V. Raghavan Lateral root initiation in *Marsilea quadrifolia*. I. Origin and histogenesis of lateral roots 123

J. W. Oross and J. V. Possingham Tubular structures in developing plastids of three dicotyledonous species 136

A. L. Samuels, A. D. M. Glass, D. L. Ehret, and J. G. Menzies Distribution of silicon in cucumber leaves during infection by powdery mildew fungus (*Sphaerotheca fuliginea*) 140

Ian D. Reid and Alain M. Deschamps Nutritional regulation of synthetic lignin (DHP) degradation by the selective white-rot fungus *Phlebia* (*Merulius*) *tremellosa*: effects of glucose and other cosubstrates 147

Ian D. Reid Nutritional regulation of synthetic lignin (DHP) degradation by *Phlebia* (*Merulius*) *tremellosa*: effects of nitrogen 156

Manuela Giovannetti, Luciano Avio, and Loredana Salutini Morphological, cytochemical, and ontogenetic characteristics of a new species of vesicular–arbuscular mycorrhizal fungus 161

T. R. Gordon and D. Okamoto Vegetative compatibility groupings in a local population of *Fusarium oxysporum* 168

O. Reisman-Berman, J. Kigel, and B. Rubin Dormancy patterns in buried seeds of *Datura ferox* and *D. stramonium* 173

Monique Gardes, Thomas J. White, J. André Fortin, Thomas D. Bruns, and John W. Taylor Identification of indigenous and introduced symbiotic fungi in ectomycorrhizae by amplification of nuclear and mitochondrial ribosomal DNA 180

Hua Yan, Hong-Yuan Yang, and William A. Jensen Ultrastructure of the developing embryo sac of sunflower (*Helianthus annuus*) before and after fertilization 191

W. Greenaway, S. English, F. R. Whatley, and S. B. Rood Interrelationships of poplars in a hybrid swarm as studied by gas chromatography – mass spectrometry 203

Björn Widén Environmental and genetic influences on phenology and plant size in a perennial herb, *Senecio integrifolius* 209

Printed in Canada / Imprimé au Canada

Filippo Imperato Polyphenolics of phylogenetic and biosynthetic interest from the fern *Cystopteris fragilis* 218

NOTES

R. L. Peterson and D. P. Whittier Transfer cells in the sporophyte–gametophyte junction of *Lycopodium appressum* 222

Roy Turkington and Elena Klein Integration among ramets of *Trifolium repens* 226

Instructions to authors v

Recommandations aux auteurs viii

FEBRUARY / FÉVRIER

ARTICLES

John N. Owens, Anna M. Colangeli, and Sheila J. Morris Factors affecting seed set in Douglas-fir (*Pseudotsuga menziesii*) 229

Narender S. Nehra, Kutty K. Kartha, and Cecil Stushnoff Nuclear DNA content and isozyme variation in relation to morphogenic potential of strawberry (*Fragaria* × *ananassa*) callus cultures 239

Robert Bauer, Mary L. Berbee, and Franz Oberwinkler An electron microscopic study of meiosis and the spindle pole body cycle in the smut fungus *Sphacelotheca polygoni-serrulati* 245

John C. Semple, Jerry G. Chmielewski, and Colleen Leeder A multivariate morphometric study and revision of *Aster* subg. *Doellingeria* sect. *Triplopappus* (Compositae: Astereae): the *Aster umbellatus* complex 256

D. M. Britton and J. P. Goltz *Isoetes prototypus*, a new diploid species from eastern Canada 277

Bernard R. Baum, Chi Yen, and Jun-Liang Yang *Roegneria*: its generic limits and justification for its recognition 282

Ido Schechter, D. C. Elfving, and J. T. A. Proctor Apple tree canopy development and photosynthesis as affected by rootstock 295

David J. Gifford, Phyllis L. Dale, and Kevin A. Wenzel Lodgepole pine seed germination. III. Patterns of protein and nucleic acid synthesis in the megagametophyte and embryo 301

Yves Tirilly The role of fosetyl-Al in the potential integrated control of *Fulvia fulva* 306

M. I. Arabi, G. Barrault, A. Sarrafi et L. Albertini Étude des variations de radiosensibilité des semences d'orge (*Hordeum vulgare*) en fonction de la teneur en eau 311

W. A. Russin, M. K. Clayton, and R. D. Durbin Modeling nonexponential growth of a short-cycling plant, *Tagetes erecta* (Asteraceae) 316

George J. Wilder Normal and teratological pistillate spikes of *Typha angustifolia* (Typhaceae): gross aspects of morphology, anatomy, symmetry, and inflorescence dehiscence 321

Tommy C. Seawall and Jeffrey C. Pommerville The role of endoplasmic reticulum during gametogenesis in the aquatic fungus *Allomyces macrogynus* 336

F. Lapeyrie, J. Ranger, and D. Vairelles Phosphate-solubilizing activity of ectomycorrhizal fungi *in vitro* 342

Godo Stoyke and R. S. Currah Endophytic fungi from the mycorrhizae of alpine ericoid plants 347

M. M. Lülsdorf and F. B. Holl Leghemoglobin variability in the genus *Phaseolus* 353

Gregory J. Taylor, Kenneth J. Stadt, and Mark R. T. Dale Modelling the phytotoxicity of aluminum, cadmium, copper, manganese, nickel, and zinc using the Weibull frequency distribution 359

D. J. Thompson and D. G. Stout Duration of the juvenile period in diffuse knapweed (*Centaurea diffusa*) 368

Janet MacFall, Steven A. Slack, and Jaya Iyer Effects of *Hebeloma arenosa* and phosphorus fertility on growth of red pine (*Pinus resinosa*) seedlings 372

Janet MacFall, Steven A. Slack, and Jaya Iyer Effects of *Hebeloma arenosa* and phosphorus fertility on root acid phosphatase activity of red pine (*Pinus resinosa*) seedlings 380

Kemuel S. Badger and Irwin A. Ungar Life history and population dynamics of *Hordeum jubatum* along a soil salinity gradient 384

Pam G. Krannitz and M. Anwar Maun An experimental study of floral display size and reproductive success in *Viburnum opulus*: importance of grouping 394

Christian R. Lacroix and Usher Posluszny A morphometric analysis of leaf development in *Vitis riparia*, and grape cultivars Concord and Vivant 400

T. N. Sieber, F. Sieber-Canavesi, and C. E. Dorworth Endophytic fungi of red alder (*Alnus rubra*) leaves and twigs in British Columbia 407

Minna Turunen and Satu Huttunen Effect of simulated acid rain on the epicuticular wax of Scots pine needles under northerly conditions 412

David D. Pope and Conrad F. Wehrhahn Quantitative genetics of disease incidence in *Ustilago hordei* controlled by virulence and aggressiveness genes 420

Christopher J. Whelan, Mary F. Willson, Charles A. Tuma, and Isabel Souza-Pinto Spatial and temporal patterns of postdispersal seed predation 428

MARCH / MARS

ARTICLES

Dane R. Roberts, Peter Toivonen, and Stephanie M. McInnis Discrete proteins associated with overwintering of interior spruce and Douglas-fir seedlings 437

B. K. Thompson, J. Weiner, and S. I. Warwick Size-dependent reproductive output in agricultural weeds 442

S. G. Mansfield, L. G. Briarty, and S. Erni Early embryogenesis in *Arabidopsis thaliana*. I. The mature embryo sac 447

S. G. Mansfield and L. G. Briarty Early embryogenesis in *Arabidopsis thaliana*. II. The developing embryo 461

B. T. Terhune, E. A. Allen, H. C. Hoch, W. P. Wergin, and E. F. Erbe Stomatal ontogeny and morphology in *Phaseolus vulgaris* in relation to infection structure initiation by *Uromyces appendiculatus* 477

Alicja M. Zobel and Stewart A. Brown Psoralens on the surface of seeds of Rutaceae and fruits of Umbelliferae and Leguminosae 485

Scott Zona A morphometric and taxonomic reevaluation of *Haenianthus* (Oleaceae) 489

G. L. Barron A new genus, ***Rotiferophthora***, to accommodate the *Diheterospora*-like endoparasites of rotifers 494

G. L. Barron A new genus of the Hyphomycetes endoparasitic in bdelloid rotifers with conidia that lodge in the mastax 503

C. P. Chanway and F. B. Holl Biomass increase and associative nitrogen fixation of mycorrhizal *Pinus contorta* seedlings inoculated with a plant growth promoting *Bacillus* strain 507

Sharon Harney and Paul Widden The ecology of *Paecilomyces farinosus* in two balsam fir forests infested with spruce budworm 512

Steven L. Miller, C. D. Koo, and Randy Molina Characterization of red alder ectomycorrhizae: a preface to monitoring belowground ecological responses 516

Kenji Seiwa and Kihachiro Kikuzawa Phenology of tree seedlings in relation to seed size 532

D. F. Grigal Elemental dynamics in forested bogs in northern Minnesota 539

Chang Yi Xie and Peggy Knowles Spatial genetic substructure within natural populations of jack pine (*Pinus banksiana*) 547

R. M. Bartlett, U. Matthes-Sears, and D. W. Larson Microsite- and age-specific processes controlling natural populations of *Acer saccharum* at cliff edges 552

Robert A. Blanchette, Kory R. Cease, André R. Abad, Todd A. Burnes, and John R. Obst Ultrastructural characterization of wood from Tertiary fossil forests in the Canadian Arctic 560

R. A. Shoemaker, C. E. Babcock, and J. A. G. Irwin ***Massarina walkeri*** n.sp., the teleomorph of *Acrocalymma medicaginis* from *Medicago sativa* contrasted with *Leptosphaeria pratensis*, ***L. weimeri*** n.sp., and *L. viridella* 569

Lea Corkidi, Emmanuel Rincon, and Carlos Vazquez-Yanes Effects of light and temperature on germination of heteromorphic achenes of *Bidens odorata* (Asteraceae) 574

Jinliang Li, I. Brent Heath, and K.-J. Cheng The development and zoospore ultrastructure of a polycentric chytridiomycete gut fungus, ***Orpinomyces joyonii*** comb.nov. 580

D. A. Douglas Clonal architecture of *Salix setchelliana* (gravel bar willow) in Alaska 590

Catherine Riaux-Gobin The diatom genus *Cocconeis* from an intertidal mud flat of North Brittany: source and diversity 597

Joseph R. Newhouse and William L. MacDonald The ultrastructure of hyphal anastomoses between vegetatively compatible and incompatible virulent and hypovirulent strains of *Cryphonectria parasitica* 602

J. E. Adaskaveg, R. A. Blanchette, and R. L. Gilbertson Decay of date palm wood by white-rot and brown-rot fungi 615

Masatoshi Saikawa, Rafael F. Castañeda Ruiz, Bryce Kendrick, and T. R. Nag Raj Genera coelomycetum XXVIII. ***Zelosatchmopsis*** anam.-gen.nov. 630

D. M. Britton A hybrid *Isoetes*, *I.* ×*harveyi*, in northeastern North America 634

Edward H. Hogg and Victor J. Lieffers The relationship between seasonal changes in rhizome carbohydrate reserves and recovery following disturbance in *Calamagrostis canadensis* 641

Jeffrey R. Foster and William K. Smith Stomatal conductance patterns and environment in high elevation phreatophytes of Wyoming 647

Thompson Demetrio Pizzolato Vascular system of the fertile spikelet of *Sorghum* (Gramineae: Panicoideae) 656

A. Manjunath and M. Habte Root morphological characteristics of host species having distinct mycorrhizal dependency 671

Y. S. Xie, J. T. Arnason, B. J. R. Philogène, J. Atkinson, and P. Morand Distribution and variation of hydroxamic acids and related compounds in maize (*Zea mays*) root system 677

NOTES

Phyllis T. Himmel Inoculation of *Euphorbia lathyris* with cotton strings infested with *Macrophomina phaseolina*, causal agent of charcoal rot disease 682

Jeannie Gilbert and David Punter Germination of pollen of the dwarf mistletoe *Arceuthobium americanum* 685

APRIL / AVRIL

ARTICLES

R. L. Counts and P. F. Lee Germination and early seedling growth in some northern wild rice (*Zizania palustris*) populations differing in seed size 689

Sharon I. Forrest, Desh Pal S. Verma, and Rajinder S. Dhindsa Starch content and activities of starch-metabolizing enzymes in effective and ineffective root nodules of soybean 697

Alan B. Darlington and Michael A. Dixon The hydraulic architecture of roses (*Rosa hybrida*) **702**

R. Scott, J. Hoddinott, G. J. Taylor, and K. Briggs The influence of aluminum on growth, carbohydrate, and organic acid content of an aluminum-tolerant and an aluminum-sensitive cultivar of wheat **711**

Hélène St-Pierre, Réjean Gagnon et Pierre Bellefleur Distribution spatiale de la régénération après feu de l'épinette noire (*Picea mariana*) et du pin gris (*Pinus banksiana*) dans la forêt boréale, Réserve faunique Ashuapmushuan, Québec **717**

C. A. Burchill and N. C. Kenkel Vegetation–environment relationships of an inland boreal salt pan **722**

Irwin M. Brodo Studies in the lichen genus *Ochrolechia*. 2. Corticolous species of North America **733**

R. J. Reader and J. Buck Control of seedling density on disturbed ground: role of seedling establishment for some midsuccessional, old-field species **773**

T. J. Carleton and D. J. Read Ectomycorrhizas and nutrient transfer in conifer – feather moss ecosystems **778**

Dorothy M. Peteet Postglacial migration history of lodgepole pine near Yakutat, Alaska **786**

Rajeev K. Upadhyay, Doug Kenfield, Gary A. Strobel, and Wilford M. Hess ***Ascochyta cypericola*** sp. nov. causing leaf blight of purple nutsedge (*Cyperus rotundus*) **797**

W. C. Mueller, R. D. Goos, J. Quainoo, and A. T. Morgham The structure of the phialides (mucronate hyphopodia) of the Meliolaceae **803**

J. P. Meysselle, G. Gay, and J. C. Debaud Intraspecific genetic variation of acid phosphatase activity in monokaryotic and dikaryotic populations of the ectomycorrhizal fungus *Hebeloma cylindrosporum* **808**

Richard J. Staniforth and Peter A. Scott Dynamics of weed populations in a northern subarctic community **814**

Ulisses G. Batista and Verna J. Higgins Accumulation of phytoalexins in the compatible interaction between *Cladiosporium fulvum* and tomato in relation to colonization **822**

Per Milberg Fern spores in a grassland soil **831**

D. A. Wubah, M. S. Fuller, and D. E. Akin *Neocallimastix*: a comparative morphological study **835**

Taylor A. Steeves, Margaret W. Steeves, and A. Randall Olson Flower development in *Amelanchier alnifolia* (Maloideae) **844**

P. F. Fransz and J. H. N. Schel An ultrastructural study on the early development of *Zea mays* somatic embryos **858**

Marie-France Turlier, Josiane Alabouvette et Diane Doulain-Douvier La morphogenèse florale chez le pétunia. III. Déviations dans le programme organogène chez un mutant femelle stérile **866**

Hao Shougang and Charles B. Beck ***Catenalis digitata***, gen. et sp.nov., a plant from the Lower Devonian (Siegenian) of Yunnan, China **873**

W. F. Leong, T. K. Tan, K. D. Hyde, and E. B. Gareth Jones ***Halosarpheia minuta*** sp.nov., an ascomycete from submerged mangrove wood **883**

Jimmy K. Triplett and Bruce K. Kirchoff Lamina architecture and anatomy in the Heliconiaceae and Musaceae (Zingiberales) **887**

NOTE

Mary E. Dettmann and David M. Jarzen Pollen evidence for Late Cretaceous differentiation of Proteaceae in southern polar forests **901**

MAY / MAI

Second International Symposium on Inorganic Carbon Utilization by Aquatic Photosynthetic Organisms

Le deuxième symposium international sur l'utilisation du carbone inorganique par les organismes photosynthétiques aquatiques

ARTICLES

Brian Colman Introduction **907**

John A. Raven Implications of inorganic carbon utilization: ecology, evolution, and geochemistry **908**

Anthony G. Miller, George S. Espie, and David T. Canvin Active CO_2 Transport in cyanobacteria **925**

George S. Espie, Anthony G. Miller, Ramani A. Kandasamy, and David T. Canvin Active HCO_3^- transport in cyanobacteria **936**

Judy Lieman-Hurwitz, Rakefet Schwarz, Flor Martinez, Zeev Maor, Leonora Reinhold, and Aaron Kaplan Molecular analysis of high CO_2 requiring mutants: involvement of genes in the region of *rbc*, including *rbcS*, in the ability of cyanobacteria to grow under low CO_2 **945**

Teruo Ogawa Cloning and characterization of the genes required for inorganic carbon transport of *Synechocystis* PCC6803 **951**

J. M. Shively and R. S. English The carboxysome, a prokaryotic organelle: a mini-review **957**

G. Dean Price and Murray R. Badger Evidence for the role of carboxysomes in the cyanobacterial CO_2-concentrating mechanism **963**

Murray R. Badger, G. Dean Price, and Jian Wei Yu Selection and analysis of mutants of the CO_2-concentrating mechanism in cyanobacteria **974**

Leonora Reinhold, Ronnie Kosloff, and Aaron Kaplan A model for inorganic carbon fluxes and photosynthesis in cyanobacterial carboxysomes **984**

Steven M. Grassl Na^+-coupled bicarbonate transport in renal proximal tubular epithelia **989**

Dieter F. Sültemeyer, Henrich P. Fock, and David T. Canvin Active uptake of inorganic carbon by *Chlamydomonas reinhardtii*: evidence for simultaneous transport of HCO_3^- and CO_2 and characterization of active CO_2 transport 995

Mikio Tsuzuki and Shigetoh Miyachi CO_2 syndrome in *Chlorella* 1003

Martin H. Spalding, Thomas L. Winder, James C. Anderson, Anne M. Geraghty, and Laura F. Marek Changes in protein and gene expression during induction of the CO_2-concentrating mechanism in wild-type and mutant *Chlamydomonas* 1008

James V. Moroney and Catherine B. Mason The role of the chloroplast in inorganic carbon acquisition by *Chlamydomonas reinhardtii* 1017

Caterina Rotatore and Brian Colman The localization of active inorganic carbon transport at the plasma membrane in *Chlorella ellipsoidea* 1025

M. J. Merrett Inorganic carbon transport in some marine microalgal species 1032

R. Michael L. McKay and Sarah P. Gibbs Composition and function of pyrenoids: cytochemical and immunocytochemical approaches 1040

M. Okada, Y. Okabe, M. Kono, K. Nakayama, and H. Satoh Peptide composition and enzyme activities of isolated pyrenoids from the green alga *Bryopsis maxima* 1053

Kazuyuki Kuchitsu, Mikio Tsuzuki, and Shigetoh Miyachi Polypeptide composition and enzyme activities of the pyrenoid and its regulation by CO_2 concentration in unicellular green algae 1062

David N. Silverman The catalytic mechanism of carbonic anhydrase 1070

H. David Husic Extracellular carbonic anhydrase of *Chlamydomonas reinhardtii*: localization, structural properties, and catalytic properties 1079

Hideya Fukuzawa, Sarami Ishida, and Shigetoh Miyachi DNA cloning and gene expression of carbonic anhydrase in *Chlamydomonas reinhardtii* 1088

J. R. Coleman, Irene Luinenburg, Nathalie Majeau, and Nicholas Provart Sequence analysis and regulation of expression of a gene coding for carbonic anhydrase in *Chlamydomonas reinhardtii* 1097

S. Bedu and F. Joset Studies on the carbonic anhydrase activity in *Synechocystis* PCC6803 wild type and an acetazolamide-resistant mutant 1103

Tetsuro Mimura, Stacey A. Frost-Shartzer, and William L. Lucas Influence of protein synthesis inhibitors on the extracellular current pattern and electrophysiological properties of internodal cells of *Chara corallina* 1109

H. Miedema and H. B. A. Prins pH-dependent proton permeability of the plasma membrane is a regulating mechanism of polar transport through the submerged leaves of *Potamogeton lucens* 1116

Andrew M. Johnston The acquisition of inorganic carbon by marine macroalgae 1123

Andrew R. Klemer Effects of nutritional status on cyanobacterial buoyancy, blooms, and dominance, with special reference to inorganic carbon 1133

David H. Turpin, Greg C. Vanlerberghe, Alan M. Amory, and Robert D. Guy The inorganic carbon requirements for nitrogen assimilation 1139

John Beardall, Simon Roberts, and Jenny Millhouse Effects of nitrogen limitation on uptake of inorganic carbon and specific activity of ribulose-1,5-bisphosphate carboxylase/oxygenase in green microalgae 1146

Anthony G. Miller, George S. Espie, and David T. Canvin The effects of inorganic carbon and oxygen on fluorescence in the cyanobacterium *Synechococcus* UTEX 625 1151

JUNE / JUIN

ARTICLES

Benjamin C. Lu Cell degeneration and gill remodelling during basidiocarp development in the fungus *Coprinus cinereus* 1161

Elida Stasovski and Carol A. Peterson The effects of drought and subsequent rehydration on the structure and vitality of *Zea mays* seedling roots 1170

G. R. Powell and Kathleen J. Tosh The pollination mechanism and development after bud burst of cones of *Larix laricina* 1179

A. A. Marsolais, D. P. M. Wilson, M. J. Tsujita, and T. Senaratna Somatic embryogenesis and artificial seed production in Zonal (*Pelargonium* × *hortorum*) and Regal (*Pelargonium* × *domesticum*) geranium 1188

James E. Thomas, Christine A. Goertzen, and Kazuo Nakamura Heterogeneity in endogenous amino acid pools of *Chlamydomonas reinhardtii* and *C. eugametos* 1194

C. Y. Chen and Michelle C. Heath Cytological studies of the hypersensitive death of cowpea epidermal cells induced by basidiospore-derived infection by the cowpea rust fungus 1199

J. Taylor and C. W. Mims Fungal development and host cell responses to the rust fungus *Puccinia substriata* var. *indica* in seedling and mature leaves of susceptible and resistant pearl millet 1207

Jill Webb and Michael K. Theodorou ***Neocallimastix hurleyensis*** sp.nov., an anaerobic fungus from the ovine rumen 1220

Hank A. Margolis, Sandra Delaney, Louis-P. Vézina, and Pierre Bellefleur The partitioning of ^{14}C between growth and differentiation within stem-deformed and healthy black spruce seedlings 1225

D. A. Wubah, M. S. Fuller, and D. E. Akin Isolation of monocentric and polycentric fungi from the rumen and feces of cows in Georgia 1232

Bruce A. Manny, Thomas A. Edsall, and Daniel E. Wujek *Compsopogon* cf. *coeruleus*, a benthic red alga (Rhodophyta) new to the Laurentian Great Lakes **1237**

Doug M. Materi and Bruce G. Cumming Effects of carbohydrate deprivation on rejuvenation, apospory, and regeneration in ostrich fern (*Matteuccia struthiopteris*) sporophytes **1241**

T. R. Nag Raj Updates on some species of *Discosia* **1246**

Samira R. Mansour and John G. Torrey *Frankia* spores of strain HFPCgI4 as inoculum for seedlings of *Casuarina glauca* **1251**

I. Castorena-Sánchez, R. M. Escobedo, and A. Quiroz New cytotaxonomical determinants recognized in six taxa of *Agave* in the sections *Rigidae* and *Sisalanae* **1257**

Hélène Chamberland, G. B. Ouellette, F. J. Pauzé, and P. M. Charest Immunocytochemical localization of tomato pectinesterase in root cells of tomato plants infected by *Fusarium oxysporum* f.sp. *radicis-lycopersici* **1265**

Y. A. Papadopoulos, B. R. Christie, G. J. Boland, and L. V. Busch The use of histochemical analysis and stem colonization for distinguishing reactions of alfalfa to verticillium wilt **1275**

G. L. Barron and E. Szijarto A new *Harposporium* with triangular conidia attacking bdelloid rotifers **1284**

C. J. Bilbrough and J. H. Richards Branch architecture of sagebrush and bitterbrush: use of a branch complex to describe and compare patterns of growth **1288**

K. Budd A cadmium-tolerant strain of *Neocosmospora vasinfecta* shows reduced cadmium influx **1296**

Joel S. Shore Chromosomal evidence for autotetraploidy in the *Turnera ulmifolia* complex (Turneraceae) **1302**

E. W. A. Boehm and D. J. McLaughlin An ultrastructural karyotype for the fungus *Eocronartium muscicola* using epifluorescence preselction of pachytene nuclei **1309**

S. Visser, R. M. Danielson, and D. Parkinson Field performance of *Elaeagnus commutata* and *Shepherdia canadensis* (Elaeagnaceae) inoculated with soil containing *Frankia* and vesicular–arbuscular mycorrhizal fungi **1321**

J. G. Lafontaine, B. T. Luck, and S. Gugg Nucleolus-associated bodies in meristematic cells of two plant species (*Cicer arietinum* and *Leucaena glauca*) with different ploidy levels **1329**

G. I. McIntyre and A. J. Cessna Apical dominance in *Phaseolus vulgaris*: effect of the nitrogen supply **1337**

C. Kar and K. Gupta Effect of triazole-type plant growth regulators on sunflower and safflower seed viability **1344**

Carol Jacobs Peck and Nels R. Lersten Samara development of black maple (*Acer saccharum* ssp. *nigrum*) with emphasis on the wing **1349**

Thomas W. H. Backman Genotypic and phenotypic variability of *Zostera marina* on the west coast of North America **1361**

M. L. Farquhar and R. L. Peterson Later events in suppression of *Fusarium* root rot of red pine seedlings by the ectomycorrhizal fungus *Paxillus involutus* **1372**

Hobart R. Williamson and Pesach ben Yitzchak The synaptonemal complexes of *Achlya recurva* (Oomycetes): karyotype analysis and three-dimensional reconstruction of pachytene nuclei in antheridia and oogonia **1384**

JULY / JUILLET

ARTICLES

R. J. Reader Relationship between seedling emergence and species frequency on a gradient of ground cover density in an abandoned pasture **1397**

G. L. Barron A new species of *Dwayaangam* parasitic on eggs of rotifers and nematodes **1402**

Michael G. Milgroom, William L. MacDonald, and Mark L. Double Spatial pattern analysis of vegetative compatibility groups in the chestnut blight fungus, *Cryphonectria parasitica* **1407**

J. Q. Hou and G. M. Simpson Effects of prolonged light on germination of six lines of wild oat (*Avena fatua*) **1414**

Eiji Uheda and Shunji Kitoh Electron microscopic observations of the envelopes of isolated algal packets of *Azolla* **1418**

B. Shipley, P. A. Keddy, and L. P. Lefkovitch Mechanisms producing plant zonation along a water depth gradient: a comparison with the exposure gradient **1420**

S. G. Aiken and S. E. Gardiner SDS–PAGE of seed proteins in *Festuca* (Poaceae): taxonomic implications **1425**

J. G. Chmielewski and C. C. Chinnappa Gender dependent and independent morphological dimorphism in sexual and apomictic *Antennaria monocephala* sensu lato **1433**

Björn Berg and Gunnar Ekbohm Litter mass-loss rates and decomposition patterns in some needle and leaf litter types. Long-term decomposition in a Scots pine forest. VII **1449**

Jianhua Zhang and M. A. Maun Effects of partial removal of seed reserves on some aspects of seedling ecology of seven dune species **1457**

L. A. Hermanutz and S. E. Weaver Variability in temperature-dependent germination in eastern black nightshade (*Solanum ptycanthum*) **1463**

Suzanne Racette, John G. Torrey, and R. Howard Berg Sporulation in root nodules of actinorhizal plants inoculated with pure cultured strains of *Frankia* **1471**

Gerald F. Bills and Jon D. Polishook Microfungi from *Carpinus caroliniana* **1477**

G. Bagatto and J. D. Shorthouse Accumulation of copper and nickel in plant tissues and an insect gall of lowbush blueberry, *Vaccinium angustifolium*, near an ore smelter at Sudbury, Ontario, Canada **1483**

C. Lynn Palmer and William H. Parker Phenotypic variation in Yukon populations of subalpine fir **1491**

Yasuko Kaneko, Hisashi Matsushima, and Yukio Morohashi Localization of amylase activity in cotyledons of germinated mung bean seeds **1501**

J. M. Szeicz and G. M. MacDonald Postglacial vegetation history of oak savanna in southern Ontario **1507**

Michael J. Trinick, Celia Miller, and Paul A. Hadobas Formation and structure of root nodules induced on *Macroptilium atropurpureum* inoculated with various species of *Rhizobium* **1520**

Francis J. Menapace A preliminary micromorphological analysis of *Eleocharis* (Cyperaceae) achenes for systematic potential **1533**

Douglas A. Wilcox and James E. Meeker Disturbance effects on aquatic vegetation in regulated and unregulated lakes in northern Minnesota **1542**

M. Muntañola-Cvetković, Jelena Vukojević, and M. Mihaljčević The systemic nature of the sunflower disease caused by *Diaporthe helianthi* **1552**

John P. Kociolek and Eugene F. Stoermer Taxonomy and ultrastructure of some *Gomphonema* and *Gomphoneis* taxa from the upper Laurentian Great Lakes **1557**

Catherine Potvin Temperature-induced variation in reproductive success: field and control experiments with the C_4 grass *Echinochloa crus-galli* **1577**

C. Watin-de-Pontfarcy et C. Bigot Embryogenèse somatique et regénération de plantes à partir de protoplastes issus de suspensions cellulaires de céleri (*Apium graveolens*) **1583**

César S. B. Costa, Ulrich Seeliger, and César V. Cordazzo Leaf demography and decline of *Panicum racemosum* populations in coastal foredunes of southern Brazil **1593**

U. Posluszny and P. B. Tomlinson Shoot organization in the seagrass *Halophila* (Hydrocharitaceae) **1600**

Karen L. Kincheloe and Rober A. Stehn Vegetation patterns and environmental gradients in coastal meadows on the Yukon–Kuskokwim delta, Alaska **1616**

D. W. Larson and P. E. Kelly The extent of old-growth *Thuja occidentalis* on cliffs of the Niagara Escarpment **1628**

AUGUST / AOÛT

ARTICLES

Claudia Paoletti, Massimo Pigliucci, and Mauro Serafini Microenvironmental correlates of phenotypic variation in *Capsella bursa-pastoris* (Cruciferae) **1637**

Myriam R. Fernandez and Michèle C. Heath Interactions of the nonhost French bean plant (*Phaseolus vulgaris*) with parasitic and saprophytic fungi. IV. Effect of preinoculation with the bean rust fungus on growth of parasitic fungi nonpathogenic on beans **1642**

E. G. Reekie and R. E. Redmann Effects of water stress on the leaf demography of *Agropyron desertorum, Agropyron dasystachyum, Bromus inermis,* and *Stipa viridula* **1647**

E. C. Swann and C. W. Mims Ultrastructure of freeze-substituted appressoria produced by aeciopsore germlings of the rust fungus *Arthuriomyces peckianus* **1655**

Mary E. Edwards, Janice C. Dawe, and W. Scott Armbruster Pollen size of *Betula* in northern Alaska and the interpretation of late Quaternary vegetation records **1666**

Alicja M. Zobel, Stewart A. Brown, and Raymond E. March Histological localization of psoralens in fruits of *Psoralea bituminosa* **1673**

Alain Olivier, Nicole Benhamou, and Gilles D. Leroux Cell surface interactions between sorghum roots and the parasitic weed *Striga hermonthica*: cytochemical aspects of cellulose distribution in resistant and susceptible host tissues **1679**

Mark H. R. Browning and Thomas C. Hutchinson The effects of aluminum and calcium on the growth and nutrition of selected ectomycorrhizal fungi of jack pine **1691**

T. Page Owen, Jr. and William W. Thomson Structure and function of a specialized cell wall in the trichomes of the carnivorous bromeliad *Brocchinia reducta* **1700**

Paul Bayman and Peter J. Cotty Vegetative compatibility and genetic diversity in the *Aspergillus flavus* population of a single field **1707**

Yolande Dalpé Statut endomycorhizien du genre *Oidiodendron* **1712**

R. Boasson and M. Shaw The transition from germ tubes to vegetative growth in uredospores of *Melampsora lini* **1715**

Ian D. Campbell and J. H. McAndrews Cluster analysis of late Holocene pollen trends in Ontario **1719**

Pierre J. Charest, Yvonne Devantier, Christine Ward, Catherine Jones, Ulriche Schaffer, and Krystyna K. Klimaszewska Transient expression of foreign chimeric genes in the gymnosperm hybrid larch following electroporation **1731**

Loni M. Walker and Fred D. Sack Recovery of gravitropism after basipetal centrifugation in protonemata of the moss *Ceratodon purpureus* **1737**

Peter Lesica, Bruce McCune, Stephen V. Cooper, and Won Shic Hong Differences in lichen and bryophyte communities between old-growth and managed second-growth forests in the Swan Valley, Montana **1745**

Katherine J. Lewis and Everett M. Hansen Vegetative compatibility groups and protein electrophoresis indicate a role for basidiospores in spread of *Inonotus tomentosus* in spruce forests of British Columbia **1756**

C. David Boyle and Klaus E. Hellenbrand Assessment of the effect of mycorrhizal fungi on drought tolerance of conifer seedlings **1764**

H. Tranvan, F. Bardat, M. Jacques et Y. Arnaud Rajeunissement chez le *Sequoia sempervirens* : effets du microgreffage *in vitro* 1772

Barry J. Shelp, David C. Taylor, and Louise M. Nelson Carbon and nitrogen partitioning in young nodulated pea (wild type and nitrate reductase-deficient mutant) plants exposed to NO_3^- or NH_4^+ 1780

J. Moret et N. Galland Caractérisation des taxons du genre *Ornithogalum*, sous-genre *Heliocharmos* (Hyacinthaceae), en Afrique du Nord et en France : analyse morphologique et biogéographique 1787

Mary L. Berbee, Robert Bauer, and F. Oberwinkler The spindle pole body cycle, meiosis, and basidial cytology of the smut fungus *Microbotryum violaceum* 1795

Gary J. Griffin, H. Clay Smith, Albert Dietz, and John R. Elkins Importance of hardwood competition to American chestnut survival, growth, and blight development in forest clearcuts 1804

Gérard Cusset Modélisation de la croissance de la tige feuillée 1810

M. Nicole, A. Toppan, J. P. Geiger, D. Roby, D. Nandris, and B. Rio Defense responses of *Hevea brasiliensis* to elicitors from root rot fungi 1819

Roni Aloni, Ayala Raviv, and Carol A. Peterson The role of auxin in the removal of dormancy callose and resumption of phloem activity in *Vitis vinifera* 1825

C. B. Wolfe, Jr. Type studies in *Tylopilus* (Boletaceae). V. Taxa described by Alexander H. Smith, Harry D. Thiers, and Samuel J. Mazzer 1833

L. Lamontagne, C. Camiré et C. Ansseau La végétation forestière du delta de Lanoraie, Québec 1839

Y. Lizzi et Ph. J. Coulomb Comportement des fractions peroxydasique et catalasique solubles au cours d'interactions entre le piment et le virus de la mosaïque du tabac ou le *Phytophthora capsici* 1853

G. P. Munkvold and D. Neely Development of *Tubakia dryina* on host tissue 1865

SEPTEMBER / SEPTEMBRE

ARTICLES

T. E. Tautorus, L. C. Fowke, and D. I. Dunstan Somatic embryogenesis in conifers 1873

Myriam R. Fernandez Recovery of *Cochliobolus sativus* and *Fusarium graminearum* from living and dead wheat and nongramineous winter crops in southern Brazil 1900

Ernest Small and Manal Fawzy A clarification of the *Medicago polyceratia – Medicago orthoceras* complex 1907

M. H. Chen, C. C. Chen, D. N. Wang, and F. C. Chen Somatic embryogenesis and plant regeneration from immature embryos of *Carica papaya* × *Carica cauliflora* cultured *in vitro* 1913

O. Q. Hendrickson, W. H. Fogal, and D. Burgess Growth and resistance to herbivory in N_2-fixing alders 1919

Mohammed S. Lamhamedi and J. André Fortin Genetic variations of ectomycorrhizal fungi: extramatrical phase of *Pisolithus* sp. 1927

Judith M. Canne-Hilliker and Christine M. Kampny Taxonomic significance of leaf and stem anatomy of *Agalinis* (Scrophulariaceae) from the U.S.A. and Canada 1935

Robert J. Marquis Physiological constraints on response by *Ostrya virginiana* (Betulaceae) to localized folivory 1951

Shirley A. Owens and Frank W. Ewers The development of cauliflory in redbud, *Cercis canadensis* (Fabaceae) 1956

J. Dore and D. A. Stahl Phylogeny of anaerobic rumen Chytridiomycetes inferred from small subunit ribosomal RNA sequence comparisons 1964

Paul Garth Harrison Mechanisms of seed dormancy in an annual population of *Zostera marina* (eelgrass) from The Netherlands 1972

Jeanne C. Chambers Patterns of growth and reproduction in a perennial tundra forb (*Geum rossii*): effects of clone area and neighborhood 1977

Kathy M. Nomme and Paul G. Harrison A multivariate comparison of the seagrasses *Zostera marina* and *Zostera japonica* in monospecific versus mixed populations 1984

John C. Hogenbirk and Ross W. Wein Fire and drought experiments in northern wetlands: a climate change analogue 1991

A. M. Svircev, A. R. Biggs, and N. W. Miles Isolation and partial purification of phytotoxins from liquid cultures of *Leucostoma cincta* and *Leucostoma persoonii* 1998

Kathy M. Nomme and Paul G. Harrison Evidence for interaction between the seagrasses *Zostera marina* and *Zostera japonica* on the Pacific coast of Canada 2004

Bernard R. Baum and Grant Bailey A numerical taxonomic investigation of the *Hordeum brevisubulatum* aggregate 2011

A. R. Biggs Leaf abscission kinetics of peach cultivars and clones in relation to peach canker disease 2020

D. Phillips, G. Weste, and J. M. Hinch Resistance to *Phytophthora cinnamomi* in callus tissue derived from three avocado cultivars 2026

Pamela K. Diggle Labile sex expression in andromonoecious *Solanum hirtum*: pattern of variation in floral structure 2033

Rajendra Chaubal, V. A. Wilmot, and Willard K. Wynn Visualization, adhesiveness, and cytochemistry of the extracellular matrix produced by urediniospore germ tubes of *Puccinia sorghi* 2044

Danny Rioux and G. B. Ouellette Barrier zone formation in host and nonhost trees inoculated with *Ophiostoma ulmi*. I. Anatomy and histochemistry 2055

Danny Rioux and G. B. Ouellette Barrier zone formation in host and nonhost trees inoculated with *Ophiostoma ulmi*. II. Ultrastructure **2074**

NOTES

R. J. Reader Control of seedling emergence by ground cover: a potential mechanism involving seed predation **2084**

J. M. Szeicz and G. M. MacDonald Erratum: Postglacial vegetation history of oak savanna in southern Ontario **2087**

Helen Kennedy Erratum: *Calathea burle-marxii* and *Ctenanthe burle-marxii* (Marantaceae): two new cultivated species from Brazil **2088**

OCTOBER / OCTOBRE

ARTICLES

Karol S. Elias, R. W. Schneider, and M. M. Lear Analysis of vegetative compatibility groups in nonpathogenic populations of *Fusarium oxysporum* isolated from symptomless tomato roots **2089**

P. E. Lauri et E. Terouanne Éléments pour une approche morphométrique de la croissance végétale et de la floraison : le cas d'espèces tropicales du modèle de Leeuwenberg **2095**

Souheil Haddad et Alain Coudret Effets de l'adjonction de KCl ou de $CaCl_2$ sur la tolérance au NaCl chez deux cultivars de triticale (Clercal et Beagle) **2113**

Darwyn S. Coxson Nutrient release from epiphytic bryophytes in tropical montane rain forest (Guadeloupe) **2122**

Chih-Cheng T. Chao and Albert H. Ellingboe Selection for mating competence in *Magnaporthe grisea* pathogenic to rice **2130**

Pamela F. Scales and R. L. Peterson Structure and development of *Pinus banksiana* – *Wilcoxina* ectendomycorrhizae **2135**

Pamela F. Scales and R. L. Peterson Structure of ectomycorrhizae formed by *Wilcoxina mikolae* var. *mikolae* with *Picea mariana* and *Betula alleghaniensis* **2149**

Durland L. Shumway, Kim C. Steiner, and Marc D. Abrams Effects of drought stress on hydraulic architecture of seedlings from five populations of green ash **2158**

M. M. West and J. N. A. Lott A histological and elemental analysis study of the mature seed of *Begonia semperflorens* **2165**

T. N. Sieber, F. Sieber-Canavesi, O. Petrini, A. K. M. Ekramoddoullah, and C. E. Dorworth Characterization of Canadian and European *Melanconium* from some *Alnus* species by morphological, cultural, and biochemical studies **2170**

S. D. Oberholster, C. M. Peterson, and R. R. Dute Pedicel abscission of soybean: cytological and ultrastructural changes induced by auxin and ethephon **2177**

Neil A. Anderson, Glenn R. Furnier, Andrew S. Wang, and John W. Schwandt The number and distribution of incompatibility factors in natural populations of *Pleurotus ostreatus* and *Pleurotus sapidus* **2187**

R. Bronner, E. Westphal, and F. Dreger Enhanced peroxidase activity associated with the hypersensitive response of *Solanum dulcamara* to the gall mite *Aceria cladophthirus* (Acari: Eriophyoidea) **2192**

M. I. Arabi, G. Barrault, A. Sarrafi et L. Albertini Effet de l'irradiation des semences d'orge (*Hordeum vulgare*) sur la croissance des jeunes plantules et la résistance au *Drechslera teres* **2197**

Sonali Roychoudhury and Martha J. Powell Ultrastructure of mitosis in the algal parasitic fungus *Polyphagus euglenae* **2201**

Normand Villeneuve, Miroslav M. Grandtner, and J. André Fortin The coenological organization of ectomycorrhizal macrofungi in the Laurentide Mountains of Quebec **2215**

B. Thiébaut et B. Comps Répartition de la matière sèche entre les organes végétatifs et reproducteurs dans les pousses annuelles du hêtre européen (*Fagus sylvatica*) **2225**

Odette Rohfritsch and Hanna Arnold-Rinehart Gall development and fine structure of the nutritive cells of *Myopites blotii* (Diptera, Tephritidae) on *Inula salicina* **2232**

B. R. Taylor, C. E. Prescott, W. J. F. Parsons, and D. Parkinson Substrate control of litter decomposition in four Rocky Mountain coniferous forests **2242**

Shiro Tsuyuzaki Survival characteristics of buried seeds 10 years after the eruption of the Usu volcano in northern Japan **2251**

Ann Francine Greer and Zohreh Tabaeizadeh Characterization and plant regeneration of cell suspension cultures of *Lycopersicon chilense* **2257**

Laurie L. Consaul, Suzanne I. Warwick, and John McNeill Allozyme variation in the *Polygonum lapathifolium* complex **2261**

N. Brun, M. Colson, A. Perrin, and B. Voirin Chemical and morphological studies of the effects of ageing on monoterpene composition in *Mentha* × *piperita* leaves **2271**

Haixin Xu and Kurt Mendgen Early events in living epidermal cells of cowpea and broad bean during infection with basidiospores of the cowpea rust fungus **2279**

J. Reynaud, M. Jay, and S. Blaise Evolution and differentiation of populations of *Lotus corniculatus* s.l. (Fabaceae) from the southern French Alps (Massif du Ventoux and Montagne de Lure) **2286**

S. English, W. Greenaway, and F. R. Whatley Bud exudate composition of *Populus tremuloides* **2291**

Andrew B. Prankevicius and Duncan M. Cameron Bacterial dinitrogen fixation in the leaf of the northern pitcher plant (*Sarracenia purpurea*) **2296**

G. A. Allen, L. D. Gottlieb, and V. S. Ford Electrophoretic evidence for the independent origins of two self-pollinating subspecies of *Clarkia concinna* (Onagraceae) 2299

Suresh C. Tiwari and Paul B. Green Shoot initiation on a *Graptopetalum* leaf: sequential scanning electron microscopic analysis for epidermal division patterns and quantitation of surface growth (kinematics) 2302

Akira Nakagiri and Tadayoshi Ito Basidiocarp development of the cyphelloid gasteroid aquatic basidiomycetes *Halocyphina villosa* and *Limnoperdon incarnatum* 2320

NOTE

Jonathan S. Price On the occurrence of hypersaline sediments in James Bay coastal marshes 2328

NOVEMBER / NOVEMBRE

ARTICLES

Katherine F. LoBuglio, Scott O. Rogers, and C. J. K. Wang Variation in ribosomal DNA among isolates of the mycorrhizal fungus *Cenococcum geophilum* 2331

P. M. Miller, L. E. Eddleman, and J. M. Miller The response of juvenile and small adult western juniper (*Juniperus occidentalis*) to nitrate and ammonium fertilization 2344

Donald J. Daigle and Peter J. Cotty The influence of cysteine, cysteine analogs, and other amino acids on spore germination of *Alternaria* species 2353

John Bissett A revision of the genus *Trichoderma*. II. Infrageneric classification 2357

John Bissett A revision of the genus *Trichoderma*. III. Section *Pachybasium* 2373

John Bissett A revision of the genus *Trichoderma*. IV. Additional notes on section *Longibrachiatum* 2418

Bernard R. Baum and L. Grant Bailey Relationships among native and introduced North American species of *Hordeum*, based on chloroplast DNA restriction-site variation 2421

Leif Tibell The *Asterophoma* anamorph of *Chaenothecopsis savonica* and its hyphomycetous synanamorph 2427

D. R. Vogler, B. B. Kinloch, Jr., F. W. Cobb, Jr., and T. L. Popenuck Isozyme structure of *Peridermium harknessii* in the western United States 2434

A. M. Ba, J. Garbaye, and J. Dexheimer Influence of fungal propagules during the early stage of the time sequence of ectomycorrhizal colonization on *Afzelia africana* seedlings 2442

S. P. Vander Kloet The consequences of mixed pollination on seed set in *Vaccinium corymbosum* 2448

C. Gerald Van Dyke and Charles W. Mims Ultrastructure of conidia, conidium germination, and appressorium development in the plant pathogenic fungus *Colletotrichum truncatum* 2455

Zhaowei Liu and Peggy Knowles Patterns of allozyme variation in tamarack (*Larix laricina*) from northern Ontario 2468

E. G. Reekie and F. A. Bazzaz Phenology and growth in four annual species grown in ambient and elevated CO_2 2475

D. W. Kelly, P. R. Hicklenton, and E. G. Reekie Photosynthetic response of geranium to elevated CO_2 as affected by leaf age and time of CO_2 exposure 2482

H. Aulfinger, E. B. Braun-Howland, S. Kannaiyan, and S. A. Nierzwicki-Bauer Ultrastructural changes of the endosymbionts of *Azolla microphylla* during megaspore germination and early plantlet development 2489

N. C. Kenkel, A. L. McIlraith, C. A. Burchill, and G. Jones Competition and the response of three plant species to a salinity gradient 2497

Ting Zhou, R. D. Reeleder, and S. A. Sparace Interactions between *Sclerotinia sclerotiorum* and *Epicoccum purpurascens* 2503

E. F. Haskins Occurrence of pseudopodial abstriction in the aphanoplasmodium of *Stemonitis flavogenita* (Myxomycetes, Stemonitales) 2511

Gonzalo Nieto Feliner Breeding systems and related floral traits in several *Erysimum* (Cruciferae) 2515

R. S. Koppenaal, T. J. Tschaplinski, and S. J. Colombo Carbohydrate accumulation and turgor maintenance in seedling shoots and roots of two boreal conifers subjected to water stress 2522

P. W. J. van Wyk and M. J. Wingfield Ultrastructural study of ascoma and ascospore development in *Ophiostoma distortum* and *Ophiostoma minus* 2529

Léonie B. Nadeau, Mark R. T. Dale, and Jane R. King The development of spatial pattern in shoots of *Linaria vulgaris* (Scrophulariaceae) growing on fallow land or in a barley crop 2539

Sara Maldonado and John N. A. Lott Protein bodies in *Datura stramonium* seeds: structure and mineral nutrient composition 2545

Peter G. Kevan, John D. Ambrose, and James R. Kemp Pollination in an understorey vine, *Smilax rotundifolia*, a threatened plant of the Carolinian forests in Canada 2555

Young H. Kwon, Harvey C. Hoch, and James R. Aist Initiation of appressorium formation in *Uromyces appendiculatus*: organization of the apex, and the responses involving microtubules and apical vesicles 2560

NOTES

Hari B. Krishnan, Jerry A. White, and Steven G. Pueppke Immunocytochemical localization of wheat prolamins in the lumen of the rough endoplasmic reticulum 2574

Richard A. Nolan Influence of a negatively charged surface (Teflon disk) on *Entomophaga aulicae* protoplast morphogenesis under mass fermentation conditions 2578

DECEMBER / DÉCEMBRE

ARTICLES

R. J. Hebda, C. C. Chinnappa, and B. M. Smith Pollen morphology of the Rosaceae of western Canada. IV. *Luetkea, Oemleria, Physocarpus, Prunus* 2583

S. P. Bentivenga and B. A. D. Hetrick Relationship between mycorrhizal activity, burning, and plant productivity in tallgrass prairie 2597

Yoav Bashan, Hanna Levanony, and Reuven Or Association between *Alternaria macrospora* and *Alternaria alternata*, causal agents of cotton leaf blight 2603

Yoav Bashan, Hanna Levanony, and Reuven Or Wild beets as an important inoculum source of *Alternaria alternata*, a cause of leaf blight of cotton in Israel 2608

Rodney J. Scott and Leslie G. Hickok Inheritance and characterization of a dark-germinating, light-inhibited mutant in the fern *Ceratopteris richardii* 2616

Robert S. Boyd Population biology of west coast *Cakile maritima*: effects of habitat and predation by *Peromyscus maniculatus* 2620

Christer Nilsson, Maria Gardfjell, and Gunnel Grelsson Importance of hydrochory in structuring plant communities along rivers 2631

Issei Kobayashi, Yuhko Kobayashi, Naoto Yamaoka, and Hitoshi Kunoh An immunofluorescent cytochemical technique applying micromanipulation to detect microtubules in plant tissue inoculated with fungal spores 2634

R. Knittel and E. J. Pell Effects of simulated acidic rain on upper leaf surface of *Zea mays* foliage 2637

Yenhung Li and Janice M. Glime Growth response of two *Sphagnum* species to photoperiod 2643

G. W. Saunders and L. D. Druehl Restriction enzyme mapping of the nuclear ribosomal cistron in selected Laminariales (Phaeophyta): a phylogenetic assessment 2647

D. J. Gillespie and J. A. McComb Morphology and distribution of species in the *Medicago murex* complex 2655

Sylvia G. Gottlob-McHugh and Douglas A. Johnson Detection of a subfamily of genes within the soybean nodulin-A multigene family 2663

M. L. Otte, M. J. Dekkers, J. Rozema, and R. A. Broekman Uptake of arsenic by *Aster tripolium* in relation to rhizosphere oxidation 2670

E. G. Reekie Cost of seed versus rhizome production in *Agropyron repens* 2678

Steven C. Grossnickle and John H. Russell Gas exchange processes of yellow-cedar (*Chamaecyparis nootkatensis*) in response to environmental variables 2684

Orson K. Miller, Jr. New species of *Amanita* from Western Australia 2692

M. Morgante, G. G. Vendramin, and P. Rossi Effects of stand density on outcrossing rate in two Norway spruce (*Picea abies*) populations 2704

G. A. Zahka and F. Virányi Axenic culture of the downy mildew fungus *Plasmopara halstedii* in *Agrobacterium rhizogenes*-induced roots of sunflower (*Helianthus annuus*) 2709

A. D. Wilson Somatic incompatibility in dikaryotic–monokaryotic and dikaryotic pairings of *Echinodontium tinctorium* 2716

H. Carlson, U. Stenram, M. Gustafsson, and H.-B. Jansson Electron microscopy of barley root infection by the fungal pathogen *Bipolaris sorokiniana* 2724

Kjell Wahlström, Jan-Olof Karlsson, Ottmar Holdenrieder, and Jan Stenlid Pectinolytic activity and isozymes in European *Armillaria* species 2732

Melva N. Philipson Septal and lateral pores in the fungal endophytes of two pasture grasses 2740

David M. Chapin, L. C. Bliss, and L. J. Bledsoe Environmental regulation of nitrogen fixation in a high arctic lowland ecosystem 2744

Jorge Dubcovsky and Arturo J. Martínez Chromosome complement and nucleoli in the *Festuca pallescens* alliance from South America 2756

A. P. Singh and M. E. Hedley Electron microscopic and chemical study of degraded *Pinus radiata* wood from a marine pile 2762

Helena Poyarkova, Z. K. Gerechter-Amitai, and A. Genizi Two variants of wild emmer (*Triticum dicoccoides*) native to Israel: morphology and distribution 2772

W. A. Charlton Studies in the Alismataceae. IX. Development of the flower in *Ranalisma humile* 2790

A. Tsuneda, N. Maekawa, I. Ohira, and I. Furukawa Incipient decay of *Quercus serrata* sapwood by *Lentinus edodes* and its inhibition by an antagonistic hyphomycete, *Leptodontidium elatius* 2797

NOTE

Dennis E. Ferguson Allelopathic potential of western coneflower (*Rudbeckia occidentalis*) 2806

Note of appreciation / Note de reconnaisance v

Author index for Volume 69 / Index des auteurs pour le volume 69 AI-1

Subject index for Volume 69 / Index des matières pour le volume 69 SI-1

Contents for Volume 69 / Sommaire pour le volume 69 C-1